PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Kenneth D. Ceola
Application No.:	09/538,785
Filed:	March 30, 2000
For:	Magnetically Sensed Second Environment Safety And Arming Device
Examiner:	Jordan M. Lofdahl
Group Art Unit:	3644

Box AF
Commissioner for Patents
Washington, D.C. 20231

Docket No.: A39.2-8766

APPEAL BRIEF

This is a Brief on Appeal for the above-identified application in which claims 1-14 were rejected in a Final Office Action mailed December 11, 2001. This brief is in furtherance of the Notice of Appeal filed in this case on March 11, 2002. The fees required under 37 C.F.R. §1.17(f) and any required petition for extension of time for filing this brief therefore are dealt with in the accompanying Transmittal Letter. This brief is transmitted in triplicate in accordance with 37 C.F.R. § 1.192(a). The Commissioner is authorized to charge Deposit Account No. 22-0350 for any other fees which may be due with this Appeal.

(1) Real Party in Interest

The application is assigned to Alliant Techsystems Inc., at 600 Second street N.E. Hopkins. Minnesota 55343-8384, a Delaware Corporation.

(2) Related Appeals and Interferences

At present there are no related appeals or interferences.

(3) Status of Claims

Claims 1-14 have been finally rejected and are the subject of this appeal. These claims are set forth in APPENDIX A of this Brief.

In a Reply to the Office Action mailed October 2, 2001, Applicant argued the validity of claims 1-14 over the references cited in the Final Office Action. No amendments were made to the claims.

In the Final Office Action of December 11, 2001, claims 1-14 were finally rejected.

In response to the Final Office Action, Applicant submitted a Notice of Appeal dated March 11, 2002.

(4) Status of Amendments

Claims 1-14 as originally filed remain pending in the present Application. No amendments have been made to the claims as filed.

(5) Summary of the Invention

With reference to the specification and figures, the claimed invention on appeal, in one embodiment, is directed to a safety and arming device 10 which utilizes a magnetic sensor (12) to determine two or more events, such as muzzle exit, spin rate, and count turns, prior to arming the fuze of the projectile. In some embodiments the apparatus 10 also ensures that the determined safing and arming events occur in the correct order and at the expected time. The magnetic sensor data may also be combined with other events, such as setback and/or a time window to substantially increase the safety of gun fired fuze systems.

In another embodiment the invention is directed to a method for safing and arming a projectile.

A safety and arming device and method, such as is described in the instant claims, is a required element of a munition to ensure that the munition is not armed and detonated until the desired time. The safety and arming device (S & A) is part of a munition's fuze and prevents arming of the fuze until certain conditions are met.

The S & A method and apparatus 10 described in the present Application as filed includes a magnetic sensor 12, for determining the occurrence of at least two events selected from the group consisting of muzzle exit, a predetermined spin rate, and a predetermined number of turns. Whereby upon the occurrence of the at least two events the fuze of the projectile is armed.

The S & A method and apparatus 10 may further include a setback switch 14, a timing device 16, a muzzle exit signal processing block 18, a spin rate signal processing block 20

and a turns counting signal processing block 22, such as is shown in FIG. 1.

The present invention provides for the arming of the projectile's fuze only when the magnetic detector detects at least two events selected from the group consisting of muzzle exit, spin rate, and a number of turns. However, detection of additional events or environments may also be required in order for the S & A apparatus to arm the fuze (page 2, lines 5-9).

(6) Issues

1. Whether the Examiner erred in rejecting claims 1-6 under 35 U.S.C. 102(b) as anticipated by U.S. 5,497,704 to Kurschner et al (Kurschner).

2. Whether the Examiner erred in rejecting claims 1-6 under 35 U.S.C. 103(a) as being obvious over Kurschner further in view of U.S. 3,608,494 to Ziemba.

3. Whether the Examiner erred in rejecting claims 7-14 under 35 U.S.C. 103(a) as being obvious over Kurschner.

4. Whether the Examiner erred in rejecting claims 7-14 under 35 U.S.C. 103(a) as being obvious over Kurschner further in view of Ziemba.

(7) Grouping of Claims

I) Claim 1 stands or falls alone for the purpose of issue 1.

II) Claim 2 stands or falls alone for the purpose of issue 1.

III) Claim 3 stands or falls alone for the purpose of issue 1.

IV) Claim 4 stands or falls alone for the purpose of issue 1.

V) Claim 5 stands or falls alone for the purpose of issue 1.

VI) Claim 6 stands or falls alone for the purpose of issue 1.

VII) Claim 1 stands or falls alone for the purpose of issue 2.

VIII) Claim 2 stands or falls alone for the purpose of issue 2.

IX) Claim 3 stands or falls alone for the purpose of issue 2.

X) Claim 4 stands or falls alone for the purpose of issue 2.

XI) Claim 5 stands or falls alone for the purpose of issue 2.

XII) Claim 6 stands or falls alone for the purpose of issue 2.

XIII) Claim 7 stands or falls alone for the purpose of issue 3.

XIV) Claim 8 stands or falls alone for the purpose of issue 3.

XV) Claim 9 stands or falls alone for the purpose of issue 3.

XVI) Claim 10 stands or falls alone for the purpose of issue 3.

XVII) Claim 11 stands or falls alone for the purpose of issue 3.

XVIII) Claim 12 stands or falls alone for the purpose of issue 3.

XIX) Claim 13 stands or falls alone for the purpose of issue 3.

XX) Claim 14 stands or falls alone for the purpose of issue 3.

XXI) Claim 7 stands or falls alone for the purpose of issue 4.

XXII) Claim 8 stands or falls alone for the purpose of issue 4.

XXIII) Claim 9 stands or falls alone for the purpose of issue 4.

XXIV) Claim 10 stands or falls alone for the purpose of issue 4.

XXV) Claim 11 stands or falls alone for the purpose of issue 4.

XXVI) Claim 12 stands or falls alone for the purpose of issue 4.

XXVII) Claim 13 stands or falls alone for the purpose of issue 4.

XXVIII) Claim 14 stands or falls alone for the purpose of issue 4.

(8) Argument

As described in the background of the invention in the present Application, government procurement standards as described in MIL-STD-1316 require that a munition detect two unique environments or occurrences to take place in order for a fuze to be armed. Typically, setback is used as a first environment that is easily mechanically sensed (page 1, lines 15-18). As is recognized by both the present Application as well as the Kurschner reference, muzzle exit is often used as a second electrically sensed environment (see page 1, lines 22-23 of the Application as filed and Kurschner: column 7, lines 43-45).

Fuzes may be provided with sensors that are utilized for additional or different functions than safing and arming the fuze. In Kurschner for example, in addition to providing for the detection of the two environments for arming the fuze, the fuze in Kurschner also includes a magnetic sensor for determining the spin rate of the projectile (column 4, lines 4-6). The detected spin rate in Kurschner is used to calculate muzzle velocity (column 4 lines 40-42). Kurschner uses the number of turns counted for a given muzzle velocity to determine the range to burst of the projectile (column 4 lines 13-15).

Magnetic detection of environments to safe and arm a fuze, such as is provided for in the present Application, is a distinctly different procedure than magnetically detecting the

spin rate of a projectile in order to determine the range to burst of a projectile that may or may not yet be armed. There is nothing in the Kurschner reference which teaches or suggests that magnetic detection of the projectile's spin rate or number of turns is usable as one of the detectable environments for safing and arming of a fuze such as is described in the instant claims.

1. Claims 1-6 are not anticipated by Kurschner.

With respect to 35 U.S.C. §102, the Federal Circuit has held that prior art is anticipatory only if every element of the claimed invention is disclosed in a single item of prior art in the form literally defined in the claim. *Jamesbury Corp. v. Litton Indus. Products*, 756 F.2d 1556, 225 USPQ 253 (Fed. Cir. 1985); *Atlas Power Co. v. E.I.duPont DeNemours*, 750 F.2d 1569, 24 USPQ 409 (Fed. Cir. 1984); *American Hospital Supply and Travenol Labs.*, 745 F.2d 1, 223 USPQ 577 (Fed. Cir. 1984). In the present case Kurschner fails to teach all of the elements of the various embodiments described in claims 1-6.

I. Claim 1

An S & A device is a part of a munition's fuze and prevents arming of the fuze until certain conditions are met (page 1, lines 13-14). As required by MIL-STD-1316 most modern projectile munitions, such as are described in the present Application as well as in the Kurschner reference, require an S & A device that detects at least two environments or conditions prior to arming the fuze. However, unlike Kurschner which fails to describe any specific S & A apparatus, the present invention as claimed in claim 1 is directed to a unique type of S & A apparatus.

In claim 1, an S & A apparatus is disclosed that requires a magnetic sensing device for determining the occurrence of at least two events selected from the group consisting of muzzle exit, a predetermined spin rate, and a predetermined number of turns, whereby upon occurrence of the at least two events the fuze is armed. Thus, claim 1 requires that the S &A apparatus magnetically sense at least two of the events in order to arm the fuze. The S & A apparatus claimed in claim 1 differs from the Kurschner reference in a number of ways.

First, there is no description or other form of disclosure of an S & A apparatus anywhere in the Kurschner reference. Applicant however, recognizes that the fuze described in Kurschner is assumed to have an S & A apparatus, as would be recognized by anyone of ordinary skill in the art given the current requirements for projectile munitions as described in MIL-STD-1316.

Contrary to the assertion in the Final Office Action, there is nothing inherent in Kurschner regarding the arming of the fuze. It is assumed in the Final Office Action that detection of spin rate and muzzle exit must lead to the arming of the fuze despite the fact that arming the fuze is not explicitly described in the Kurschner reference. In most conventional S & A systems the fuze is armed upon mechanical detection of setback and upon electrical detection of muzzle exit. In Kurschner the various events that the magnetic sensor detects to establish a fuze mode, as opposed to arming the fuze, are not detected until after setback and muzzle exit are conventionally detected (column 7, 43-46), and the fuze is assumably armed.

Kurschner does make passing reference to electronically sensed muzzle exit being utilized as a second environment confirmation (column 7, lines 43-45), but there is no discussion

of a first environment save for the statement that the fuze includes functions that are required by present standards (column 1, lines 62-66). While, one of ordinary skill would recognize the known concepts of mechanically detecting setback and electronically sensing muzzle exit as two environments commonly used for safing and arming a fuze, this is the limit of Kurschner's disclosure regarding an S & A apparatus.

Kurschner does not claim nor explicitly describe an S & A apparatus, let alone the specific apparatus presently claimed. Moreover, it must be noted that nowhere in Kurschner is there any discussion or reference made to arming a fuze. Instead, as is clearly stated in Kurschner: "This invention relates to the field of fuzes and more particularly, to an apparatus and method for control of a projectile with fuze functions including magnetically sensing ballistic spin parameters and computing muzzle velocity ***for accurately controlling range to burst of a projectile***." (Emphasis added) (column 1, lines 5-9). One of ordinary skill in the art will recognize that an apparatus for accurately controlling range to burst of a projectile such as described in Kurschner is significantly different that an S & A apparatus such as is described in instant claim 1.

Second, because it is clear that the magnetic sensor associated with the fuze of Kurschner is not utilized as or with an S & A apparatus as required by the instant claim, the magnetic sensor that is described in Kurschner does not detect at least two events selected from the group consisting of muzzle exit, a predetermined spin rate, and a predetermined number of turns, whereby upon occurrence of the at least two events ***the fuze is armed***. Applicant recognizes that it is certainly true that Kurschner describes a magnetic sensor element capable of

detecting a number of turns, as well as detecting spin rate, there is nothing in the Kurschner reference which teaches or suggests that detection of these parameters has anything to do with arming the fuze. Instead, the detection and analysis of theses features are used in Kurschner so that a turns-to-burst detonation mode is possible (column 1, line 62 to column 2, line 11; see also column 4, lines 3-4).

As discussed above, in the Final Office Action it is asserted that in Kurschner it is inherent that the fuze is armed upon the occurrence of the two events. However, there is nothing in Kurschner which teaches arming of a fuze, other than to state that the functions inherent in the fuze include those required by present standards (i.e. MIL-STD-1316) as well as other features not available with prior art fuzes (column 1, lines 62-63). It is only inherent that the fuze of the Kurschner reference be armed upon detection of two separate environments such MIL-STD-1316 requires. There is nothing however in Kurschner which inherently or otherwise teaches that the detection of spin rate, and/or a number of turns is one or both of the environments necessary to be detected in order to ***arm the fuze*** as instant claim 1 requires. Kurschner teaches only that the detection of spin rate and number of turns is used only to provide the munition with a turns-to-burst mode.

A third difference between the Kurschner magnetic fuze and the S & A apparatus of instant claim 1 is that in regards to detecting muzzle exit, Kurschner clearly states that muzzle exit signal serves as a true electronic second environment confirmation (column 7 lines 43-46). This is in contrast to the present claims which require that the at least two events, which may include muzzle exit, be detected by the magnetic sensing apparatus. Kurschner clearly requires

that detection of muzzle exit be electronic in origin. There is nothing in Kurschner that teaches that muzzle exit be detected by a magnetic sensing apparatus as required by the instant claims.

It is clear that based on the above comments and a careful analysis of the Kurschner reference that Kurschner does not teach all of the elements of instant claim 1, namely Kurschner fails to teach an S & A apparatus having a magnetic sensor for determining the occurrence of at least two of the events selected from the group consisting of muzzle exit, a predetermined spin rate, and a predetermined number of turns, whereby upon the occurrence of the at least two events the fuze is armed.

II. Claim 2

Claim 2 is dependent from claim 1. However, the S & A apparatus described in claim 2 is distinct from the S & A apparatus of claim 1 in that the S & A of claim 2 further includes a timer. The magnetic sensing apparatus is programmed to arm the fuze only if the at least two events occur in a predetermined order in a predetermined time window.

Because claim 2 is dependent from claim 1, the arguments presented above equally apply here as well.

While Kurschner includes a timer 44, there is nothing in Kurschner with teaches that the magnetic sensing apparatus is programmed to ***arm the fuze*** as required by the instant claim. Kurschner is silent as to the arming of the fuze but instead utilizes a magnetic sensor to provide the fuze with a turns-to-burst mode.

Because Kurschner fails to teach an S & A apparatus having a timer for arming a fuze, it is inherent that Kurschner also fails to teach that the at least two events need occur in a

predetermined order in a predetermined time window in order to arm the fuze as required by the instant claims.

While Kurschner does describe an order of some events, in regard to providing the fuze with a particular burst mode, there is nothing to indicate that the order of the events need take place in a given time window (see column 7, lines 48-50 and column 7, lines 24-30). Kurschner merely indicates an order of events rather than an order of events within a time window as the instant claim requires. It is clear however that even if the order of events described in Kurschner were to take place within a predetermined time window, the detection of these events by the Kurschner magnetic sensor would still fail to ***arm the fuze*** as required by the instant claims.

III. Claim 3

Claim 3 is dependent from claim 1. However, the S & A apparatus described in claim 3 is distinct from the S & A apparatus of claim 1 in that the S & A of claim 3 requires that the at least two events are muzzle exit, spin rate, and turns in a predetermined time window. In claim 1 the number of turns is not limited to a time window.

Because claim 3 is dependent from claim 1, the arguments presented above equally apply here as well.

As discussed above Kurschner is not directed to an S & A apparatus as the instant claims are. The Kurschner fuze may include, and assumably does include a conventional S & A apparatus, but there is nothing in the Kurschner reference which teaches an S & A apparatus having a magnetic sensing apparatus for determining the occurrence of at least two events of the

group consisting of muzzle exit, spin rate, and turns in a predetermined time window, whereby upon the occurrence of the at least two events the fuze is armed as required by instant claim 3.

The sensor that is provided for in Kurschner is only described in terms of providing for and determining various fuze modes (column 7, lines 24-42), but nowhere does Kurschner describe, implicitly or otherwise, that upon detection of at least two events such as muzzle exit, spin rate, and turns in a predetermined time window by a magnetic sensing apparatus is the fuze armed such as is required in the instant claims.

For these reasons claim 3 is patentably distinct over Kurschner

IV. Claim 4

Claim 4 is dependent from claim 1. However, the S & A apparatus described in claim 4 is distinct from the S & A apparatus of claim 1 in that the S & A of claim 4 requires that the at least two events are muzzle exit and a predetermined number of turns, as opposed to claim 1 which allows for more variability in that the at least two events are selected from the group consisting of muzzle exit, a predetermined spin rate, and a predetermined number of turns. Kurschner fails to teach an S & A apparatus having a

magnetic sensing apparatus for detecting either the at least two events of claim 1 or claim 3 whereby upon the occurrence of the at least two events the fuze is armed.

Because claim 4 is dependent from claim 1, the arguments presented above equally apply here as well.

There is no teaching of an S & A apparatus having all of the features of claim 3 in the Kurschner reference. Kurschner describes a fuze sensor that may be used to count turns

down range (column 4, lines 7-10). Kurschner provides no teaching that the detection of turns is to be utilized as a detectable environment for arming the fuze. Furthermore, Kurschner does provide for the detection of muzzle exit as a second environment. In Kurschner muzzle exit is electronically sensed in the conventional manner (column 7, lines 43-46) as opposed to being detected by a magnetic sensor as required by instant claim 4.

In light of the above, it is clear that Kurschner fails to teach all of the elements of claim 1.

V. Claim 5

Claim 5 depends from claim 1. However, the S & A apparatus described in claim 5 is distinct from the S & A apparatus of claim 1 in that the S & A of claim 5 requires that the at least two events be a predetermined spin rate and a predetermined number of turns. In contrast, claim 1 allows for a broader selection of detectable events by providing for at least two events are selected from the group consisting of muzzle exit, a predetermined spin rate, and a predetermined number of turns.

Because claim 5 is dependent from claim 1, the arguments presented above equally apply here as well.

Kurschner fails to teach an S & A apparatus having a magnetic sensing apparatus for detecting at least two events consisting of a predetermined spin rate and a predetermined number of turns, whereby upon the occurrence of the at least two events the fuze is armed.

One of ordinary skill in the art will recognize that a fuze mode is a fuze function that is separate and distinct from the safing and arming function of the fuze. There is no debate

that Kurschner does describe a sensor for determining spin rate and turn count (column 4, lines 3-10). However, there is nothing in Kurschner which teaches that upon the occurrence of these events does the fuze become armed. Instead, Kurschner teaches only that these events are used to establish a range dependent burst. Because Kurschner fails to teach a safety and arming apparatus for use with a projectile, comprising a magnetic sensing apparatus for determining the occurrence of at least two of the events selected from the group consisting of a predetermined spin rate and a predetermined number of turns, whereby upon the occurrence of the at least two events the fuze is armed, such as is required by claim 5, the rejection to claim 5 is respectfully overcome.

VI. Claim 6

Claim 6 depends from claim 1. However, the S & A apparatus described in claim 6 is patentably distinct from claim 1 in that claim 6 requires that the at least two events consist of all three events of muzzle exit, a predetermined spin rate and a predetermined number of turns, whereas claim 1 allows the at least two events to be selected from the group consisting of muzzle exit, a predetermined spin rate and a predetermined number of turns.

Because claim 6 is dependent from claim 1, the arguments presented above equally apply here as well.

As has been stated above, Kurschner does not teach a magnetic sensing apparatus for detecting muzzle exit as required by instant claim 6. Kurschner only mentions electronically detecting muzzle exit as opposed to magnetically detecting muzzle exit as the present claim provides for.

Also as previously mentioned, Kurschner does not teach that the magnetic detection of spin rate and turns is in anyway useful for arming the fuze. Rather Kurschner describes only the use of a detected spin rate and turn count as being useful for determining rang to burst. In the fuze art it will be recognized by one of ordinary skill that determining range to burst is known to be independent and distinct from safing and arming a fuze as the instant claim is directed to. For these reasons the rejection to claim 6 is respectfully overcome.

2. Claims 1-6 are not obvious in light of Kurschner in view of Ziemba.

VII. Claim 1

For all of the reasons discussed above, Kurschner fails to teach or otherwise disclose all of the features required for the various embodiments of an S & A apparatus described in instant claim 1-6. Moreover there is no suggestion in the Kurschner reference for providing the magnetic fuze of Kurschner with an S & A apparatus having the novel magnetic sensing apparatus described in any of claims 1-6. Besides references to existing safing and arming methods there is nothing in the Kurschner references which teaches or suggests the use of a magnetic sensing apparatus for determining the occurrence of at least two events, whereby upon the occurrence of the at least two events the fuze is armed. Moreover there is nothing in Kurschner which teaches or suggests the particular events required for arming a fuze that are required by the embodiments of claims 1-6.

In the Final Office Action, Ziemba is cited as teaching a device comprising a means to determine the spin rate which in turn creates a means to arm the fuze. The Final Office

Action states that it would be obvious to one of ordinary skill in the art to comprise the device of Kurschner employing spin rate determination as taught by Ziemba to arm the fuze after an expected time.

As previously discussed above, Kurschner states that the magnetic fuze described therein includes those functions required by present standards. One of ordinary skill in the art at the time of the reference was issued would recognize that the Kurschner fuze would necessarily meet the requirements of MIL-STD-1316 and provide for an S & A device which requires the detection of two separate and distinct environments in order to arm the fuze. A conventional S & A apparatus would typically mechanically detect setback and electronically detect muzzle exit such as is described in part by Kurschner (column 7, lines 43-46).

References must be considered as a whole and suggest the desirability and thus the obviousness of making the combination (see, e.g., *Lindemann Maschinenfabrik GmbH v. American Hoist and Derrick Co.*, 730 F.2d 1452, 1462, 221 USPQ 481, 488 (Fed. Cir. 1983)).

When viewed as a whole there is nothing in either of the cited references which provides the required suggestion or desirability to combine the references in the manner proposed in the Final Office Action. Because Kurschner already includes an adequate conventional S & A device, and further because nothing in Kurschner indicates any desire, need or other suggestion that a conventional S & A apparatus is insufficient, one of ordinary skill would not be motivation to combine the means to determine the spin rate which in turn creates a means to arm the fuze of Ziemba with the conventional S & A apparatus that it is required to employ. Nothing in Kurschner suggests a desire to include any form of alternative detectable safing and arming

environment such as spin rate described in Ziemba. Furthermore, there is nothing in Ziemba which would motivate one of ordinary skill in the art to add the time delay fuze disclosed therein to the magnetic fuze of Kurschner.

The references must be viewed without the benefit of hindsight vision afforded by the claimed invention (e.g., *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1553, 220 USPQ 303, 313 (Fed. Cir. 1983)).

Applicant has repeatedly pointed out herein that Kurschner does appear to in fact employ a magnetic sensor which may be used to detect or determine spin rate, and count turns. However, it is also clear that nowhere does Kurschner indicate that such detectable features are in anyway useful for arming the fuze. Instead Kurschner detects/determines these elements for the purpose of accurately establishing a range dependent burst. It is only when the magnetic fuze of Kurschner and the time delayed fuze of Ziemba are viewed in light of the present application through the impermissible lens of hindsight does any motivation to combine the references appear. Such impermissible use of hindsight is prohibited. But for the teaching of the present Application one of ordinary skill in the art would find no motivation to combine the cited references in the manner suggested in the Final Office Action.

The Final Office Action also states that Kurschner discloses a device comprising a magnetic sensing device for determining muzzle exit. This is simply not the case. While Kurschner does provide for a magnetic sensing device there is nothing in Kurschner to suggest that the muzzle exit sensor is anything other than a conventional electronic sensor as would be recognized by one of ordinary skill in the art. In fact Kurschner specifically calls out that muzzle

exit is detected electronically, as opposed to magnetically such as the instant claims require (column 7, lines 43-46). Ziemba makes no reference to a magnetic sensing apparatus for detecting muzzle exit.

In light of the above, the obviousness rejection to claim 1 based on Kurschner in view of Ziemba is respectfully overcome.

VIII. Claim 2

Dependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious (*Hartness Int'l, Inc. v. Simplimatic Eng'g Co.*, 819 F.2d 1100, 1108, 2 USPQ2d 1826, 1831 (Fed. Cir. 1987)).

For the purpose of attempted brevity, the required distinctiveness for each claim 2-6 is presented above in relation to issue 1 and should be read as being equally applicable to issue 2 (as well as issues 3 and 4).

Though each claim 2-6 is patentably distinct for the reasons stated above, the same core argument regarding issue 2 as applied to claim 1 above is never-the-less equally applicable to each claim 2-6, namely, that because there is no motivation to combine Kurschner and Ziemba in the manner proposed in the Final Office Action the obviousness rejection to the instant claims is respectfully overcome.

With specific regard to claim 2, there is nothing in the Kurschner reference and Ziemba reference when viewed as a whole which would teach or suggest an S & A apparatus wherein the magnetic sensing apparatus is programmed to arm the fuze only if the at least two events occur in a predetermined order in a predetermined time window. Nowhere does either

reference teach or suggest magnetically detecting at least two events selected from the group consisting of muzzle exit, a predetermined spin rate, and a predetermined number of turns, whereby upon the occurrence of the at least two events the fuze is armed.

Kurschner does provide for detecting spin rate and turns count but only for the purposes of establishing a range dependent burst. Kurschner further provides for the detection of muzzle exit but only in a conventional electronic manner. Ziemba fails to provide a means for magnetically detecting any of the occurrences relevant to the instant claim let alone in a predetermined order or within a predetermined window of time. For these reasons as well as for the reasons stated above the obviousness rejection to claim 6 based on Kurschner and Ziemba is respectfully overcome.

IX. Claim 3

For the reasons provided above, claim 3 is likewise not rendered obvious by the proposed combination of Kurschner and Ziemba. In addition to the above however, it must also be noted that neither reference when viewed alone or in combination as a whole, provides for a safety and arming apparatus for use with a projectile, comprising: a magnetic sensing apparatus for determining the occurrence of at least two events of muzzle exit, spin rate, and turns in a predetermined time window, whereby upon the occurrence of the at least two events the fuze is armed as is presently claimed.

X. Claim 4

For the reasons provided above, claim 4 is also not rendered obvious by the proposed combination of Kurschner and Ziemba. In addition to the above however, it must also

be noted that neither reference when viewed alone or in combination as a whole, provides for a magnetic sensing apparatus for determining the occurrence of at least two events selected from muzzle exit and a predetermined number of turns, whereby upon the occurrence of the at least two events the fuze is armed as is presently claimed.

In Kurschner and Ziemba, there is no description of a magnetic detector for detecting muzzle exit. The only safing and arming environment mentioned in Kurschner reference is that of electronically sensed muzzle exit as a second environment (column 7, lines 43-45). Nothing in either reference teaches or suggests magnetically detecting muzzle exit as required by the instant claim. Furthermore, while Ziemba does provide for detecting a number of turns, nowhere does either reference teach or suggest both the ***magnetic detection*** of a number of turns and the ***arming*** of a fuze thereby as required by the instant claims.

XI. Claim 5

As with all the claims of the present Application, claim 5 is not rendered obvious by the combination of Kurschner and Ziemba. In addition to the reasons provided above neither reference when viewed alone or in combination as a whole, provides for a magnetic sensing apparatus for determining the occurrence of at least two events selected from predetermined spin rate and a predetermined number of turns, whereby upon the occurrence of the at least two events the fuze is armed as is presently claimed.

Neither reference provides for a magnetic sensing apparatus for detecting events whereby upon the occurrence of those events the fuze is armed as required by any of the instant claims. While Ziemba does provide for a ball rotor fuze mechanism that has a arming delay

governed in part by the spin rate of the projectile, there is nothing in Ziemba which teaches or suggests a ***magnetic sensing apparatus*** for detecting the spin rate as is presently required. Moreover, as discussed above there is nothing in Kurschner that teaches or suggests that the magnetic sensor described therein has any function relating to the safing and arming of the fuze but instead provides the projectile with a burst mode. In addition, because Kurschner already includes a conventional S & A apparatus as discussed repeatedly above, there is no motivation to provide Kurschner with a magnetic sensing apparatus for detecting the spin rate and number of turns for the purpose of arming the fuze as the present claim requires. As a result the rejection is respectfully overcome.

XII. Claim 6

As has been stated above, Kurschner does not teach a magnetic sensing apparatus for detecting muzzle exit as required by instant claim 6. Kurschner only mentions electronically detecting muzzle exit as opposed to magnetically detecting muzzle exit as the present claim provides for. In Ziemba a ball rotor fuze is described which fails to teach or suggest a ***magnetic sensor*** for detection any of the events required by instant claim 6.

Also as previously mentioned, Kurschner does not teach that the magnetic detection of spin rate and turns is in anyway useful for arming the fuze. Rather Kurschner describes only the use of a detected spin rate and turn count as being useful for determining range to burst. While the rotor ball fuze of Ziemba does provide for the assumed detection of the projectile's spin rate, neither reference teaches or suggests the ability for a fuze to ***magnetically***

detect spin rate, ***magnetically*** detect the number of turns, and ***magnetically*** detect muzzle exit for the purpose of ***arming*** the fuze as is required.

For these reasons the rejection to claim 6 is respectfully overcome.

3. Claims 7-14 are not obvious in light of Kurschner.

XIII. Claim 7

Claim 7 depends from claim 2, which depends from claim 1. As a result the arguments presented above in relation to claims 1 and 2 apply equally to claim 7. Though a dependent claim, claim 7 is patentably distinct from claims 1 and 2 in that claim 7 recites the requirement of a setback sensor wherein the fuze is armed only upon the occurrence of setback and the at least two events in a predetermined order.

In the Final Office Action Kurschner is cited as providing a sensor capable of determining setback where the fuze is armed only if setback and the at least two events occur in a predetermined order. In response, Applicant asserts that nowhere does the Kurschner reference describe a sensor capable of determining the occurrence of setback, let alone a sensor capable of determining setback where the fuze is armed only if setback and the at least two events occur in a predetermined order. The term setback is not even recited in the Kurschner reference.

As indicated above however, Applicant has freely admitted that in keeping with conventional fuze requirements Kurschner is assumed to have a conventional S & A apparatus such as one that would mechanically detect setback and electronically detect muzzle exit. Be that as it may, there is nothing in Kurschner which teaches or suggests that the assumed conventional

S & A apparatus of Kurschner is anything other than conventional. That is to say, there is no teaching or suggestion in Kurschner of an S & A apparatus having a setback sensor wherein the fuze is armed ***only*** if setback occurs and the at least two events (as detected by the magnetic sensing apparatus) occur within a predetermined order.

Assuming that Kurschner does in fact include a setback sensor, there is nothing in Kurschner or the art as a whole, save for the present Application, that teaches or suggests the desirability of providing an S & A apparatus with a setback sensor and a magnetic sensing apparatus for detecting at least two events wherein the fuze is armed only if setback occurs and the at least two events occur in a predetermined order. As previously discussed Kurschner includes a magnetic sensor for establishing a range dependent burst (column 4, lines 3-15). But for the teaching of the present Application there would be no motivation to modify the magnetic sensor of Kurschner to act as an S & A apparatus in conjunction with a setback sensor as required by the instant claim. For these reasons as well as for the reasons presented above in relation to claims 1 and 2 it is clear that the rejection to claim 7 is respectfully overcome.

XIV. Claim 8

Claim 8 depends from claim 7, which depends from claim 2, which in turn depends from claim 1. As a result the arguments presented above in relation to claims 1 and 7 apply equally to instant claim 8. Though a dependent claim, claim 8 is patentably distinct from claims 1 and 7 because claim 8, further requires that in order for the fuze to be armed, muzzle exit must occur within a predetermined time window from when setback occurs. Neither claim 1

or claim 7 require muzzle exit to occur within a predetermined time window from the occurrence of set back.

In summary claim 8 requires a safety and arming apparatus that comprises a magnetic sensing apparatus, a timer and a setback sensor. The magnetic sensing apparatus determines the occurrence of at least two of the events selected from the group consisting of muzzle exit, a predetermined spin rate, and a predetermined number of turns, wherein the magnetic sensing apparatus is programed to arm the fuze only after setback occurs and the at least two events occur in a predetermined order in a predetermined time window and muzzle occurs within a predetermined time window from when setback occurs.

As an initial matter Applicant observes that in many of the rejections stated in the Final Office Action, particularly those directed to claims 7 and 8, seem to indicate that the magnetic sensor described in Kurschner is being asserted to act as a S & A apparatus despite the fact that there is nothing in the reference to suggest that the magnetic sensor functions as or with an S & A apparatus. However, the Final Office Action seems to agree with Applicants assertions that Kurschner includes a conventional S & A apparatus in that the Final Office Action states that Kurschner is said to include a setback sensor, as well as an electronic muzzle exit sensor.

Though Applicant agrees that Kurschner includes a conventional S & A apparatus the obviousness rejection to claims 7 and 8 cannot be maintained as there is no motivation to modify an existing conventional setback/muzzle exit S & A apparatus, such as Kurschner is assumed to include, with the S & A apparatus having a magnetic sensing apparatus as required by the instant claims. Kurschner reinforces this view by teaching the magnetic detection of spin

rate and turns counted is for the purpose of establishing a range dependent burst such as previously described, rather than for arming the fuze as presently required.

Nowhere does Kurschner describe, teach, suggest, or imply that the conventional S & A apparatus is inadequate or requires improvement. It is only when Kurschner is viewed in light of the present Application does such improvements become apparent.

While Applicant agrees that one of ordinary skill in the art would provide Kurschner with a conventional S & A apparatus, there is nothing in the art as a whole which suggests the complex combination of features present in claim 8, such as the detection of setback starting a predetermined window of time ending with the magnetic detection of muzzle exit and the at least two events occurring in a predetermined order within a predetermined window of time. As a result, the rejection is respectfully overcome.

XV. Claim 9

Claim 9 depends from claim 1. For the same reasons as applied to claim 1, as asserted above, Applicant asserts that Kurschner fails to teach or suggest all of the elements of claim 9 as required.

Kurschner does not teach or suggest an S & A apparatus having the unique features of claim 9. Kurschner also fails to teach a magnetic sensing apparatus for detecting at least two events which are required to occur prior to arming the fuze. As a result there is nothing to suggest that Kurschner could be modified to include an S & A apparatus having a magnetic sensing apparatus, wherein the fuze is armed only upon the occurrence of at least one of the events consisting of muzzle exit, a predetermined spin rate, and a predetermined number of turns

and if the spin rate is between a predetermined minimum and maximum spin rate within a predetermined time window. The rejection is thus respectfully overcome.

XVI. Claim 10

The Final Office Action rejects claims 7-14 as being obvious over Kurschner. The specific rejection to claims 10-14 is that the claims are readily apparent during the operation of the device of Kurschner. As Kurschner fails to teach or suggest any specific means or method for safing and arming a fuze at all, let alone the novel method described in the instant claims, Applicant must respectfully but strongly disagree with the rejection.

Claim 10 is an independent claim directed to a method for safing and arming a projectile comprising the steps of one, determining the occurrence of at least two of the events selected from the group consisting of muzzle exit, a predetermined spin rate, and a predetermined number of turns, and two, arming the fuze.

In order to maintain a §103 obviousness rejection, the references must be considered as a whole and suggest the desirability and thus the obviousness of making the combination (see, *e.g.*, *Lindemann Maschinenfabrik Gmbh v. American Hoist & Derrick Co.*, 730 F.2d 1452, 1462, 221 USPQ 481, 488 (Fed.Cir. 1984)).

In relation to claim instant 10, it must once again be noted however that the Kurschner reference completely fails to describe the safing and arming of fuzes. While an S & A apparatus is assumably included in the Kurschner reference, however when viewed as a whole Kurschner fails to provide any details or description for what constitutes such an S & A apparatus or method. As a result, there can be no motivation to modify or improve Kurschner,

since Kurschner is not directed to any form of safing and arming method, let alone one that is in anyway similar to the method described in the instant claims. Kurschner's failure to provide any description of a safing and arming method, and therefore its failure to provide the requisite motivation to modify such a safing and arming method, would seem to make it impossible for one of ordinary skill in the art to modify the Kurschner reference to provide for the method presently claimed.

Assuming that Kurschner does include a conventional S & A apparatus as discussed above, a conventional S & A apparatus would implicitly teach only a method wherein upon detection of setback and muzzle exit is the fuze armed. Such a conventional method does not meet the requirements of the instant claim which requires that in order to arm the fuze at least two of the events selected from the group consisting of muzzle exit, a predetermined spin rate, and a predetermined number of turns must first occur. Neither Kurschner or the art as a whole teach or suggest such a method. As a result the rejection is respectfully overcome.

XVII. Claim 11

Claim 11 depends from claim 10 and is therefore subject to all of the limitations of claim 10. For the same reason the arguments presented above in relation to claim 10 apply equally to claim 11 and should be considered as being applied hereto. Claim 11 is patentably distinct from claim 10 however, as claim 11 further requires the occurrence of setback to occur in order to arm the fuze. The added element therefore provides for a unique safing and arming method distinct from claim 10 that requires not only the at least two events of muzzle exit, a

predetermined spin rate, and a predetermined number of turns to occur in order to arm the fuze, but setback must also occur in order to arm the fuze.

As repeatedly explained above, Applicant assumes that Kurschner does include a conventional setback/muzzle exit S & A apparatus. However, there is nothing in Kurschner that would provide the necessary motivation to one of ordinary skill in the art to modify such a conventional S & A apparatus to include the additional elements required by the instant claims. While Kurschner does include a sensor for detecting a spin rate and number of turns there is no indication that detection of these events has any application to a method of safing and arming a fuze as required. Instead, Kurschner utilizes these events for the purpose of establishing a range dependent burst, or providing particular fuze modes (column 4 lines 3-15 and column 7 lines 25-30). There is nothing in Kurschner that would suggest to one of ordinary skill in the art that the detection of spin rate and/or turns counted is utilized with or as part of a safing and arming method such as is described in instant claim 11.

Because Kurschner fails to teach or suggest an S & A apparatus having all of the features of claim 11, the objection is respectfully overcome.

In addition to the above, it should be noted that the Federal Circuit has determined that dependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious (*Hartness Int'l, Inc. v. Simplimatic Eng'g Co.*, 819 F.2d 1100, 1108, 2 USPQ2d 1826, 1831 (Fed. Cir. 1987)). Applicant asserts that because claim 10 is not obvious in light of Kurschner, all claims depending from claim 10, including claims 11-14, are likewise not obvious in light of Kurschner.

XVIII. Claim 12

Claim 12 depends from claim 11 and further depends from independent claim 10. As such the arguments presented above in relation to claims 10 and 11 should be considered as being equally applicable here.

Claim 12 describes a safing and arming method distinct from the methods previously claimed by requiring a further step of arming the fuze only if the event of muzzle exit occurs within a predetermined time from when setback occurs. The previous methods of claims 10 and 11 do not require that muzzle exit occur with in a predetermined time window following setback in order to arm the fuze.

Kurschner does not describe the concept of setback. Kurschner is merely assumed to include a conventional S & A apparatus which provides a method of arming a fuze by detecting setback and muzzle exit. There is nothing in Kurschner to suggest a need or desire to modify this conventional safing and arming method in anyway. As such, there is no motivation to modify the conventional safing and arming device to require that the muzzle exit be detected within a predetermined time window from the detection of setback in order to arm the fuze such as is required in the instant claim.

Not only does Kurschner fail to teach a method having such a time window, but there is also nothing in Kurschner, or the art as a whole, which suggests combining a conventional method of safing and arming a fuze with the requirement of the time window ***and*** the requirement that at least two events of muzzle exit, predetermined spin rate and

predetermined number of turns be determined as well in order to arm the fuze as the instant claim requires. As a result the rejection is respectfully overcome.

XIX. Claim 13

Claim 13 depends from claim 12, which depends from claim 11, which in turn depends from independent claim 10. As a result the arguments presented above in relation to claims 10, 11 and 12 should be considered as being equally applicable here.

Claim 13 describes a safing and arming method distinct from the methods previously claimed by requiring a further step of arming the fuze only if the spin rate is between a predetermined minimum and maximum spin rate. Claim 13 is patentably distinct from claims 10-12. Spin rate is only one of the three event from which the at least two events of claim 10 are selected from. As a result, claims 10, 11 and 12 do not necessarily include the detection of spin rate, let alone a spin rate that is between a predetermined minimum and maximum required by the instant claim.

Kurschner includes a sensor for detecting spin rate (column 4 lines 33-42). However there is no teaching or suggestion in the Kurschner reference that the detection of spin rate has any bearing on the arming of the fuze. Kurschner only provide for the determination of spin rate for the purpose of determining a turns count (column 5, lines 29-52). Turns count is used to determine a range dependent burst (column 4, lines 3-15). There is no indication in the Kurschner reference for detecting a spin rate for the purpose of arming the fuze. Furthermore, there is nothing in Kurschner which would suggest to one of ordinary skill to provide the

conventional safing and arming method with a requirement to detect a predetermined spin rate or any of the other unique features of the instant claim.

Not only does Kurschner fail to describe a method for safing and arming a fuze which requires the occurrence of a spin rate, Kurschner also fails to teach or suggest a method for arming a fuze that includes the step of arming the fuze only if the spin rate is between a predetermined minimum and maximum spin rate.

In light of the reasons provided above the rejection to claim 13 is respectfully overcome.

XX. Claim 14

Claim 14 depends from claim 13, which depends from claim 12, which depends from claim 11, which in turn depends from independent claim 10. As a result the arguments presented above in relation to claims 10-13 should be considered as being equally applicable here.

Claim 14 describes a safing and arming method distinct from the methods previously claimed by requiring a further step of arming the fuze only after the projectile has turned a predetermined number of turns. Claim 14 is patentably distinct from claims 10-13. Turn count is only one of the three event from which the at least two events of claim 10 are selected from. As a result, claims 10-13 do not necessarily include the detection of a turn count. The language of claim 14 makes the occurrence of a predetermined number of turns a requirement in addition to any other events in order to arm the fuze.

Kurschner includes a sensor for determining turn count (column 4 lines 3-15). However there is no teaching or suggestion in the Kurschner reference that the detection of a predetermined number of turns is necessary in order to arm the fuze as is required by instant claim 14. Kurschner only provide for the determination of a turn count for the purpose of establishing a range dependent burst such as by establishing a turns to burst mode (column 4, lines 3-15 and column 7, lines 11-16). There is no indication in the Kurschner reference for determining a predetermined turns count for being required to arm a fuze. Furthermore, there is nothing in Kurschner which would suggest to one of ordinary skill to provide a conventional safing and arming (setback/muzzle exit) method with a requirement to detect a predetermined spin rate or any of the other unique features of the instant claim. As a result the rejection is respectfully overcome.

4. Claims 7-14 are not obvious in light of Kurschner in view of Ziemba.

XXI. Claim 7

For the reasons recited above in section XIII, claim 7 is patentably distinct from claims 1 and 2 from which the present claim depends. Furthermore, as discussed above claim 1-6 are not obvious over in light of the combination of Kurschner and Ziemba. For the same reasons as applied to claims 1 and 2, claim 7 is patentable over the combination of Kurschner and Ziemba.

Claim 7 recites the additional requirement of a setback sensor wherein the fuze is armed only upon the occurrence of setback and the at least two events in a predetermined order.

In the Final Office Action the combination of Kurschner and Ziemba is cited as disclosing all of the limitations of claims 7-14. In response, Applicant asserts that neither of the references, alone or in combination, teach or suggest all of the elements of the instant claims.

In regard to Kurschner, Kurschner fails to describe a safing and arming apparatus having a sensor capable of determining the occurrence of setback. In addition Kurschner fails to describe an S & A apparatus capable of determining setback where the fuze is armed only if setback and the at least two events occur in a predetermined order.

As repeatedly stated above, Kurschner assumably includes a conventional S & A apparatus, such as any fuze constructed in light of MIL-STD-1316 would include. One of ordinary skill would recognize that a conventional S & A apparatus may typically include a mechanical setback sensor and an electronic muzzle exit sensor. However, nothing in Kurschner, or the references as a whole, suggest a need to improve or otherwise alter the conventional S & A apparatus assumably included with the Kurschner fuze. Because there is no motivation or suggestion to alter the conventional S & A apparatus of Kurschner, there is certainly no motivation to combine Kurschner with Ziemba in the manner proposed in the Final Office Action.

Although no motivation exists to combine the Kurschner and Ziemba references, even if Ziemba were combined with Kurschner, the resulting hybrid would fail to include an S & A apparatus that comprises a magnetic sensing apparatus, a timer and a setback sensor, wherein

the magnetic sensing apparatus is used to determine the occurrence of at least two of the events selected from the group consisting of muzzle exit, a predetermined spin rate, and a predetermined number of turns, and wherein the magnetic sensing apparatus is programmed to arm the fuze only if the at least two events occur in a predetermined order in a predetermined time window, and the fuze is armed only if setback occurs and the at least two events occur in a predetermined order, such as required by the instant claim.

Ziemba is directed to a time delay fuze which includes a mechanical ball rotor for detecting setback force and centrifugal force (abstract). Ziemba does nothing to address the failure of Kurschner alone to teach or suggest an S & A apparatus having all of the features of instant claim 7. For example, the ***mechanical*** setback and spin sensor of Ziemba would only provide Kurschner with a mechanical setback sensor, a sensor that Kurschner is assumed to include as a part of its conventional S & A device, and a ***mechanical*** sensor for detecting spin. This is in contrast to instant claim 7 which requires a magnetic sensing apparatus for detecting the at least two events, including spin.

While Kurschner already includes a magnetic spin sensor (column 4, lines 3-17) the magnetic spin sensor of Kurschner does not function in arming the fuze. Providing the mechanical spin sensor of Ziemba would admittedly provide Kurschner with a sensor associated with arming the fuze. However, the ***mechanical*** spin sensor provided by Ziemba is clearly not a ***magnetic*** sensor as the instant claim requires.

Ziemba provides for the detection of spin following the detection of setback, however this is insufficient to meet the requirements of claim 7. When Ziemba is combined with

Kurschner, the resulting device would still fail to teach or suggest that the fuze is armed only if setback occurs **AND** the at least two events occur in a predetermined order. While Ziemba provides for the concept of detecting setback as well as detecting spin thereafter, there is nothing in Kurschner and Ziemba to suggest that at least two events selected from spin rate, muzzle exit and turns count occurs in a predetermined order as presently required.

Because there is no motivation to combine the references and further that even if the references were combined, the resulting hybrid would fail to each or suggest all of the elements of instant claim 7, the rejection is respectfully overcome.

XXII. Claim 8

Claim 8 depends from claim 7, which depends from claim 2, which in turn depends from claim 1. As a result the arguments presented above in relation to claims 1, 2 and 7 apply equally to instant claim 8.

In addition to the features required by claims 1, 2 and 7, claim 8 further requires that in order for the fuze to be armed, muzzle exit must occur within a predetermined time window from when setback occurs.

As previously stated above Applicant asserts that the magnetic sensor described in Kurschner is not an S & A apparatus or a sensor used with an S & A apparatus. There is nothing in the Kurschner reference to suggest that the magnetic sensor functions as or with an S & A apparatus. Kurschner does however include a sensor for detecting muzzle exit, however the muzzle exit sensor of Kurschner is conventional electronic sensor and not the magnetic sensor required by the instant claim.

In contrast to Kurschner, Ziemba does not teach or suggest any form of magnetic sensor. Instead, Ziemba provides for a mechanical setback and spin sensor that detects setback and spin (abstract). The mechanical sensor of Ziemba however, does appear to arm the fuze upon detection of setback and spin (column 3, lines 23-29).

For the reasons stated in the various paragraphs above it has been made abundantly clear that there is no motivation to combine Kurschner and Ziemba. However, if Kurschner and Ziemba were combined, the resulting device would still fail to include an S & A apparatus having a magnetic sensing apparatus for detecting the at least two events whereby upon the occurrence of the at least two events the fuze is armed. Furthermore, the combination of Kurschner and Ziemba would also fail to teach or suggest an S & A apparatus that requires muzzle exit to occur within a predetermined time window from the occurrence of setback as the present claim requires. Neither Kurschner or Ziemba, when viewed individually or as a whole provide any suggestion of such a timing requirement. As a result the rejection is respectfully overcome.

XXIII. Claim 9

Claim 9 depends from claim 1. For the same reasons as applied to claim 1, as asserted above, Applicant asserts that the proposed combination of Kurschner and Ziemba fails to teach or suggest all of the elements of claim 9 as required.

The cited references when viewed as a whole do not teach or suggest an S & A apparatus having the unique features of claim 9. Though Kurschner fails to teach or suggest an S & A apparatus, Kurschner is assumed to include a conventional S & A apparatus. However,

Kurschner fails to teach a magnetic sensing apparatus for detecting at least two events which are required to occur prior to ***arming*** the fuze. Because Kurschner includes an adequate conventional S & A apparatus there is nothing to provide motivation to modify the conventional S & A apparatus to provide for the unique magnetic sensing apparatus provided by the instant claims. In contrast to Kurschner, Ziemba does teach an arming mechanism. The specific arming mechanism of Ziemba however is a mechanical sensor as opposed to the required magnetic sensor provided in the instant claims. Nothing in either reference teaches or suggests a need to provide an S & A apparatus having a magnetic sensor for detecting at least two events in order to arm a fuze as the present claims require.

Furthermore, assuming that the references could be combined in the manner proposed, nothing in the references suggests that the resulting device would require a magnetically detectable spin rate that is between a predetermined minimum and maximum spin rate within a predetermined time window in order to arm the fuze, as instant claim 9 requires. For these reasons as well as those provided above, the rejection is thus respectfully overcome.

XXIV. Claim 10

The Final Office Action rejects claims 7-14 as being obvious over Kurschner in view of Ziemba. The specific rejection to claims 10-14 is that the claims are readily apparent during the operation of the devices of Kurschner and Ziemba. In addition to the arguments presented in relation to Kurschner alone, Applicant further submits that the combination of Kurschner and Ziemba fails to teach or suggest a safing and arming method comprising the steps of one, determining the occurrence of at least two of the events selected from the group

consisting of muzzle exit, a predetermined spin rate, and a predetermined number of turns, and two, arming the fuze.

For the reasons stated above, Kurschner alone fails to teach such a method. In regard to Ziemba, Ziemba teaches a mechanical sensor for arming a fuze upon the detection of setback and spin rate. The present claim requires that at least two events selected from the group consisting of muzzle exit, spin rate and turns count occur in order to arm the fuze. Ziemba provides for only one of these events, spin rate, but not at least two of the events provided.

Kurschner provides for an adequate conventional arming method and the subject matter of Ziemba is directed to a device that provides for an arming method. Absent a showing of inadequacy or some other motivation, there is no suggestion in either reference, when viewed individually or as a whole, to combine the arming methods of either reference in the manner implicitly proposed in the Final Office Action. Because there is no motivation to combine the references, the rejection is respectfully overcome.

XXV. Claim 11

Claim 11 depends from claim 10 and is therefore subject to all of the limitations of claim 10. For the same reason the arguments presented above in relation to claim 10 apply equally to claim 11 and should be considered as being applied hereto. It should be further noted as well that dependent claims are nonobvious under §103 is the independent claims from which they depend are nonobvious (*Hartness Int'l, Inc. v. Simplimatic Eng'g Co.*, 819 F.2d 1100, 1108, 2 USPQ2d 1826, 1831 (Fed. Cir. 1987)). Because claim 10 is not obvious in light of Kurschner and Ziemba, any claims dependent therefrom are likewise not obvious .

As repeatedly explained above, Applicant assumes that Kurschner does include a conventional setback/muzzle exit S & A apparatus. However, there is nothing in Kurschner that would provide the necessary motivation to one of ordinary skill in the art to combine the conventional S & A apparatus of Kurschner with the mechanical setback and spin sensor of Ziemba. For this reason and the reasons previously provided, the rejection is respectfully overcome.

XXVI. Claim 12

Claim 12 depends from claim 11 and further depends from independent claim 10. As such the arguments presented above in relation to claims 10 and 11 should be considered as being equally applicable here.

Claim 12 describes a safing and arming method distinct from the methods previously claimed by requiring a further step of arming the fuze only if the event of muzzle exit occurs within a predetermined time from when setback occurs. Neither of the cited references teach or suggest that muzzle exit must occur with in a predetermined time window following setback in order to arm the fuze.

Not only do Kurschner and Ziemba both fail to teach a method having such a time window, but there is also nothing in the cited art as a whole, which suggests combining a method of safing and arming a fuze with the requirement of the time window ***and*** the requirement that at least two events of muzzle exit, predetermined spin rate and predetermined number of turns be determined as well in order to arm the fuze as the instant claim requires. As a result the rejection is respectfully overcome.

XXVII. Claim 13

Claim 13 depends from claim 12, which depends from claim 11, which in turn depends from independent claim 10. As a result the arguments presented above in relation to claims 10, 11 and 12 should be considered as being equally applicable here.

Claim 13 describes a safing and arming method distinct from the methods previously claimed by requiring a further step of arming the fuze only if the spin rate is between a predetermined minimum and maximum spin rate.

As is made clear from the previous paragraphs, the cited references fail to teach or suggest an S & A apparatus having all of the requisite steps of the method required by the instant claims. In specific regard to claim 13, neither Kurschner or Ziemba teach or suggest the step of arming a fuze upon the occurrence of a spin rate between a predetermined minimum and maximum in addition to the other steps required by claims 10-12. As a result the rejection is respectfully overcome.

XXVIII. Claim 14

Claim 14 depends from claim 13, which depends from claim 12, which depends from claim 11, which in turn depends from independent claim 10. As a result the arguments presented above in relation to claims 10-13 should be considered as being equally applicable here.

Claim 14 describes a safing and arming method distinct from the methods previously claimed by requiring a further step of arming the fuze only after the projectile has turned a predetermined number of turns.

Neither reference provides for a method of arming a fuze having all of the steps required by any of the instant claims. While Ziemba does provide for a ball rotor fuze mechanism that has a arming delay governed in part by the spin rate of the projectile, there is nothing in Ziemba which teaches or suggests arming the fuze only upon a predetermined number of turns. However, in Kurschner there is no teaching or suggestion that the detection of turns has any function relating to the safing and arming of the fuze. Instead Kurschner merely provides for the detection of muzzle velocity, spin rate turn count, etc for the use in providing the projectile with a burst mode (column 4, lines 3-15). As a result, even if the references were to be combined, the resulting method would not include any teaching or suggestion that the detection of a predetermined number of turns has any bearing in arming the fuze contrary to the requirements of the instant claim. Therefore, the rejection is respectfully overcome.

CONCLUSION

In light of the arguments presented above Applicants respectfully request withdrawal of the rejections to claims 1-14. Claims 1-14 are pending in the Application and are in condition for allowance.

Respectfully submitted,

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APPENDIX A

What is claimed is:

1. A safety and arming apparatus for use with a projectile, comprising:

a magnetic sensing apparatus for determining the occurrence of at least two of the events selected from the group consisting of muzzle exit, a predetermined spin rate, and a predetermined number of turns,

whereby upon the occurrence of the at least two events the fuze is armed.

2. The safety and arming apparatus of claim 1 further including a timer and wherein the magnetic sensing apparatus is programmed to arm the fuze only if the at least two events occur in a predetermined order in a predetermined time window.

3. The safety and arming apparatus of claim 1 wherein the at least two events are muzzle exit, spin rate, and turns in a predetermined time window.

4. The safety and arming apparatus of claim 1 wherein the at least two events are muzzle exit and a predetermined number of turns.

5. The safety and arming apparatus of claim 1 wherein the at least two events are a predetermined spin rate and a predetermined number of turns.

6. The safety and arming apparatus of claim 1 wherein the at least two events are muzzle exit, a predetermined spin rate, and a predetermined number of turns.

7. The safety and arming apparatus of claim 2 further including a setback sensor and wherein the fuze is armed only if setback occurs and the at least two events occur in a predetermined order.

8. The safety and arming apparatus of claim 7 wherein the fuze is armed only if muzzle exit occurs within a predetermined time window from when setback occurs.

9. The safety and arming apparatus of claim 1 wherein the fuze is armed only if the spin rate is between a predetermined minimum and maximum spin rate within a predetermined time window.

10. A method for safing and arming a projectile, the steps comprising:

a) determining the occurrence of at least two of the events selected from the group consisting of muzzle exit, a predetermined spin rate, and a predetermined number of turns,

b) arming the fuze.

11. The method of claim 10 further including the step of arming the fuze only if a setback event occurs.

12. The method of claim 11 further including the step of arming the fuze only if the event of muzzle exit occurs within a predetermined time from when setback occurs.

13. The method of claim 12 further including the step of arming the fuze only if the spin rate is between a predetermined minimum and maximum spin rate.

14. The method of claim 13 further including the step of arming the fuze only after the projectile has turned a predetermined number of turns.

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